

**SGS-CSTC Standards
Technical Services
(Shanghai)Co., Ltd.**

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TEST REPORT

Application No. : SHEMO10040044201
Applicant: Kohler Co.
FCC ID: N82-KOHLER005
IC ID: 4554A-KOHLER005
Fundamental Frequency : 2405MHz to 2480MHz
Equipment Under Test (EUT):
Name: NUMI Integrated Toilet control remoter
Model No.: 1115507
Standards: FCC PART 15 SUBPART C, Section 15.247, ANSI 63.4 : 2003,
KDB 558074
RSS 210 issue 7, RSS GEN issue 2
Date of Receipt: Jun 1,2010
Date of Test: Jun 1,2010 to Jun 18,2010
Date of Issue: June 19,2010
Test Result : **PASS ***

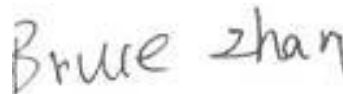
* In the configuration tested, the EUT complied with the standards specified above.

Approved by:



Tino Pan
E&E Section Manager

Tested By:



Bruce Zhan
EMC TEST Engineer

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2 Test Summary

The customer requested FCC tests for a 2.4GHz remote transmitter			
Test	Test Requirements	Test Methods	Result
AC Power Line Conducted Emission	FCC part 15 Section 15.207(a) RSS GEN Table 2	ANSI 63.4: 2003 RSS GEN	N/A
Peak Output Power	FCC part 15 Section 15.247(b)(3) RSS 210 A8.4	KDB 558074 RSS GEN	PASS
6dB Bandwidth	FCC part 15 Section 15.247(a)(2) RSS 210 A8.2	KDB 558074 RSS GEN	PASS
100KHz Bandwidth of Frequency Band Edges	FCC part 15 Section 15.247(d) RSS 210 A8.5	ANSI C63.4,2003 KDB 558074 RSS GEN	PASS
Spurious Emission	FCC part 15 Section 15.247(d) RSS 210 A8.5	ANSI C63.4,2003 KDB 558074 RSS GEN	PASS
Peak Power Density	FCC part 15 Section 15.247(e) RSS 210 A8.2	KDB 558074 RSS GEN	PASS
Antenna Requirement	FCC part 15 Section 15.203 RSS GEN issue 2	N/A	PASS

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4 General Information

4.1 Client Information

Applicant : Kohler Co.
Applicant Address: 444 Highland Drive Kohler, WI 53044
Manufacturer: Shanghai KOHLER Electronics, Ltd.
Manufacturer Address: Building E, 18 Jindian Road, Pudong New area, Shanghai, the PRC

4.2 Details of E.U.T.

Name: NUMI Integrated Toilet control remoter
Model No.: 1115507
Power Supply: DC 6V
Power Cord: N/A
Modulation type: DSSS
Antenna of Remote transmitter: Integral
Model: RMA-2R450GA1(FPC)
Operating Frequency Band: 2400-2500MHz
Gain:2.5dBi
Frequency Range& Channel number: 1.2405 MHz
2.2410 MHz
3.2415 MHz
4.2420 MHz
5.2425 MHz
6.2430 MHz
7.2435 MHz
8.2440 MHz
9.2445 MHz
10.2450 MHz
11.2455 MHz
12.2460 MHz
13.2465 MHz
14.2470 MHz
15.2475 MHz
16.2480 MHz
Test Channel: Channel 1,9,16

4.3 Description of Support Units

None.

4.4 Test Location

Tests were performed at:

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

No.588 West Jindu Road, Songjiang District, Shanghai, China. 201612.

Tel: +86 21 6191 5666 Fax: +86 21 6191 5655

4.5 Other Information Requested by the Customer

None.

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing. Date of expiry: 2011-07-29.

- **FCC – Registration No.: 402683**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered and fully described in a report filed with the Federal Communications Commission (FCC). The acceptance letter from the FCC is maintained in our files. Registration No.: 402683, Expiry Date: 2012-03-17.

- **Industry Canada (IC) – IC Assigned Code: 8617A**

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A. Expiry Date: 2011-09-29.

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-3172 and C-3514 respectively. Date of Registration: 2009-11-30. Date of Expiry: 2012-03-17.

5 Test Results

5.1 Test Instruments

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due date
1	EMI test receiver	Rohde & Schwarz	ESU40	100109	2010-6-4	2011-6-3
2	Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-679	2010-6-4	2011-6-3
3	Broadband Horn ANTENNA	SCHWARZBECK	BBHA9170	9168-313	2010-6-4	2011-6-3
4	Horn Antenna	Rohde & Schwarz	HF906	100284	2010-4-9	2011-4-8
5	ANTENNA	SCHWARZBECK	VULB9168	9168-313	2010-6-4	2011-6-3
6	Ultra broadband antenna	Rohde & Schwarz	HL562	100227	2009-10-9	2010-10-8
7	Atmosphere pressure meter	Shanghai ZhongXuan Electronic Co;Ltd	BY—2003P	--	2009-10-15	2010-10-14
8	METER	FLUKE	17B	10560713	2009-9-16	2010-9-15
9	Thermo-Hygrometer	ZHICHEN	ZC1-2	01050033	2009-10-15	2010-10-14
10	High-low temperature cabinet	Shanghai YuanZhen	GW2050	--	2009-6-18	2010-6-17
11	DC power	KIKUSUI	PMC35—3	NF100260	2010-1-16	2011-1-15
12	Power meter	Rohde & Schwarz	NRP	101641	2010-5-4	2011-5-3
13	High pass Filter	FSCW	HP 12/2800- 5AA2	19A45-02	2010-4-11	2011-4-10
14	Low noise amplifier	TESEQ	LNA6900	70133	2009-7-7	2010-7-6

5.2 E.U.T. Operation

Input voltage:	AC 120V , 60Hz
Operating Environment:	
Temperature:	20.0-25.0 °C
Humidity:	45-56 % RH
Atmospheric Pressure:	990-1018mbar
EUT Operation:	The EUT has been tested under operating condition.

5.3 Test Procedure & Measurement Data

5.3.1 Antenna Requirement

Test Requirement:	FCC 15.203 RSS GEN issue 2
Test Date:	Jun 1,2010
Measurement Distance:	3m (Semi-Anechoic Chamber)
Requirements:	An intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.The manufacturer may design the unit so that a broken antenna can be replaced by the user,but the use of a standard antenna jack or electrical connector is prohibited.This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211,15.213,15.217,15.219or 15.221.Further, this requirement does not apply to intentional radiators that must be professionally installed,such as perimeter protection systems and some field disturbance sensors,or to other Intentional radiators which,in accordance with Section 15.31(d), Must be measured at the installation site,However,the installer shall be responsible for ensuring that the proper antenna is employed so That the limits in this part are not exceeded.

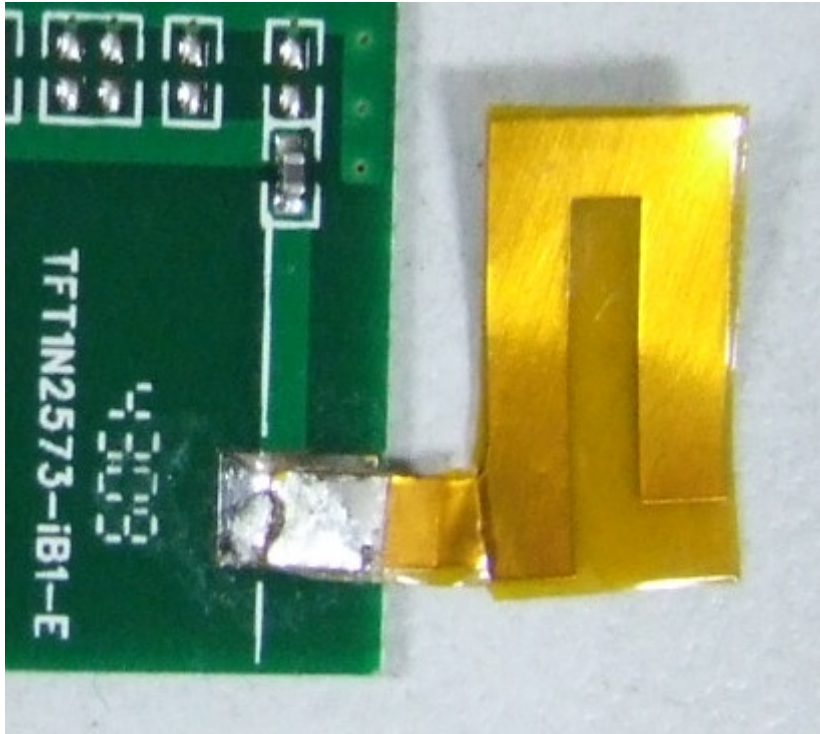
**FCC Rules
(Section15.203)** Described how the EUT complies with the requirement that either its antenna is permanently attached,or that it employs a unique Antenna connector,for every antenna proposed for use with the EUT.

The exception in those cases where EUT must be professionally Installed.In order to demonstrate that professional installation is Required,the following 3 points must be addressed:

- The application(or intended use)of the EUT
- The installation requirements of the EUT
- The method by which the EUT will be marketed

Conclusion The directional gains of antenna remote transmitter used for transmitting is 2.5dB. The RF transmitter uses an integrate antenna withot connector, Please refer to he following picture.

Remote transmitter



5.3.2 Peak Output Power Measurement

Test Requirement:	FCC 15.247(b)(3) RSS 210 A8.4
Test Method:	KDB 558074 & RSS GEN
Test date:	June 8,2010
Standard Applicable:	According to section 15.247(a)(2),(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode. (4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph(c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi. I Operation with directional antenna gains greater than 6 dBi. (1) Fixed point-to-point operation: (i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. (ii) Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum.
3. Record the max. reading
4. Repeat above procedures until all the frequency measured

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were complete.

Measurement Result:

Test Results

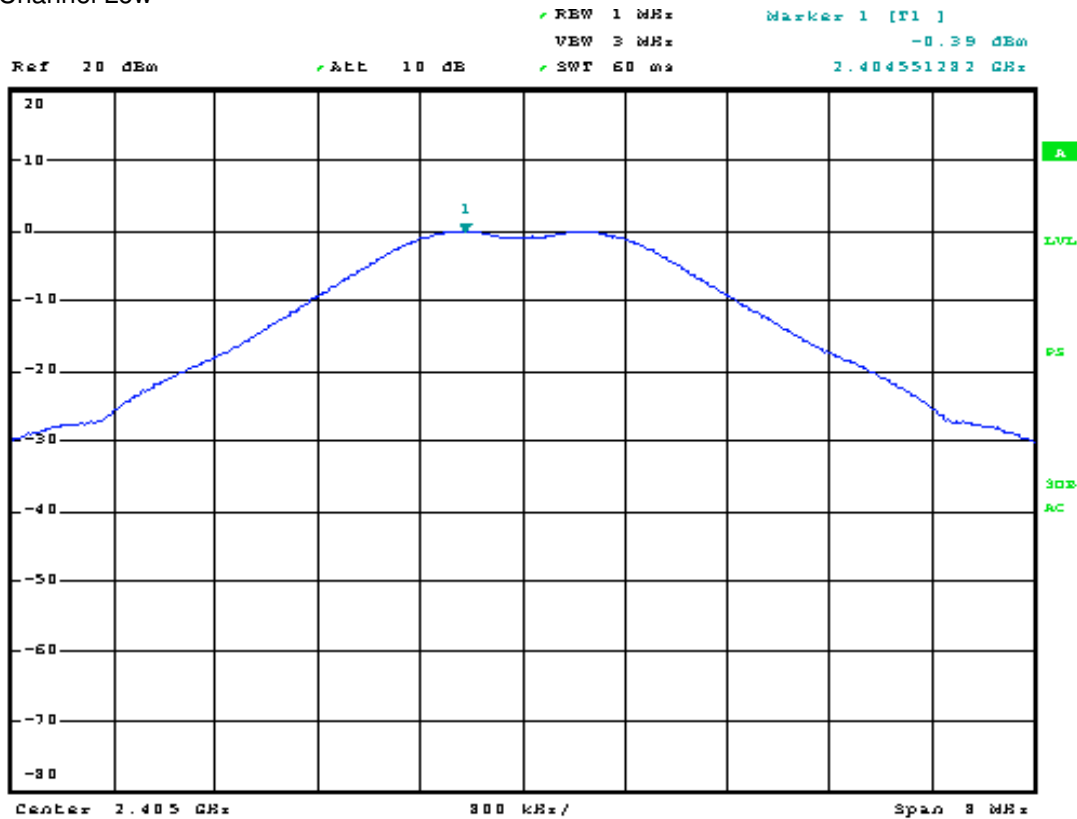
Remote transmitter:

CH	Frequency (MHz)	Reading Power(dBm)	Cable Loss (dB)	Resolution Bandwidth Corrector(dB)	Output Power (dBm)	Limit (dBm)	Result
Low	2405	-0.39	0.2	2.23	2.04	30	PASS
Middle	2445	-3.24	0.2	2.23	-0.81	30	PASS
High	2480	-5.61	0.2	2.23	-3.18	30	PASS

Remote transmitter:

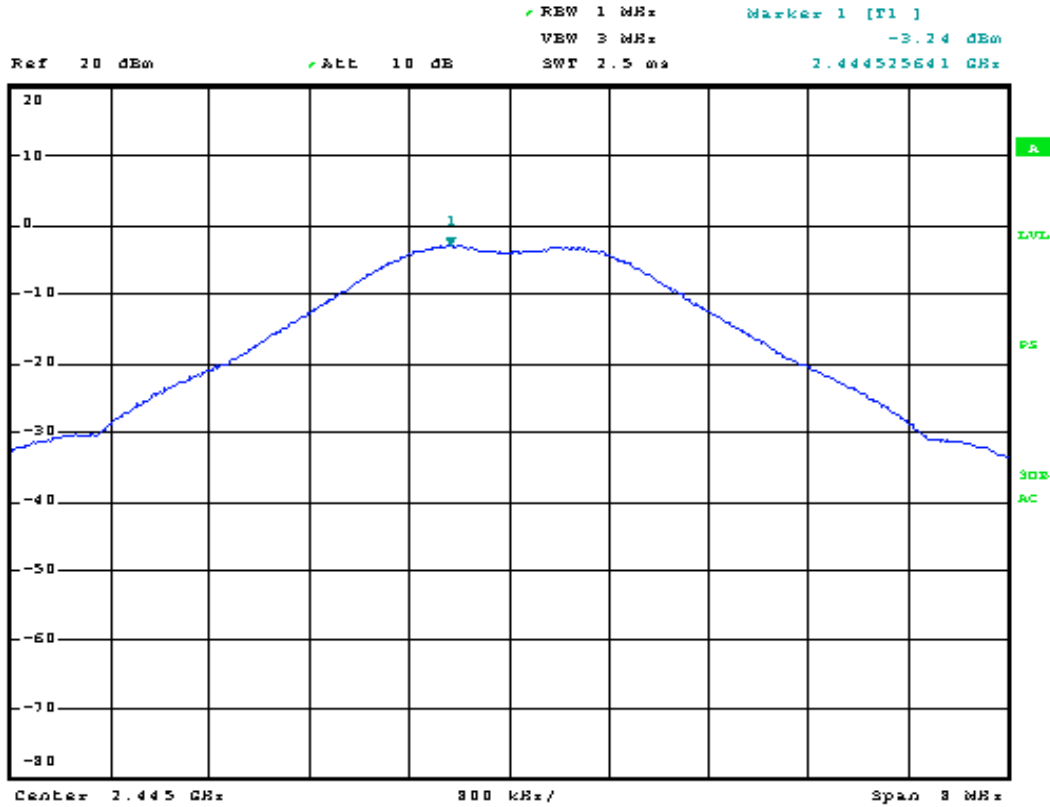
Peak Power Output Data Plot

Channel Low



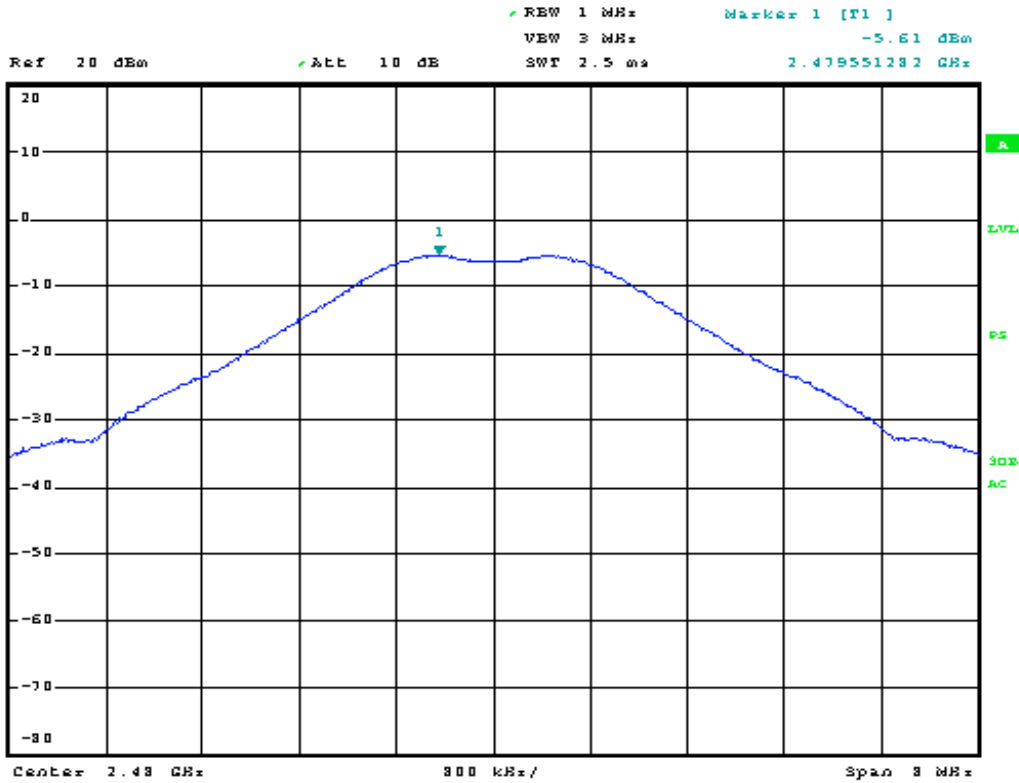
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Channel Middle



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Channel High



5.3.3 6dB Bandwidth

- Test Requirement:** FCC 15.247(a)(2)
RSS 210 A8.2
- Test Methods:** KDB 558074 & RSS GEN
- Test date:** June 7,2010
- Standard Applicable:** According to section 15.247(a)(2),Systems using digital modulation techniques may operate in the 902-928MHz,2400-2483.5MHz,and 5725-5850MHz bands.The minimum 6dB bandwidth shall be at least 500KHz.
- Measurement Procedure:**
1. Place the EUT on the table and set it in transmitting mode.
 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
 3. Set the spectrum analyzer as RBW=1% bandwidth, VBW =3* RBW, Span=30/ 50MHz, Sweep=auto
 4. Mark the peak frequency and -6dB (upper and lower) frequency.
 5. Repeat above procedures until all frequency measured were complete.

Measurement Result:

Remote transmitter:

CH	Frequency (MHz)	Bandwidth (KHz)	Limit Bandwidth (KHz)	Result
Low	2405	1586.4	500	PASS
Middle	2445	1602.5	500	PASS
High	2480	1618.5	500	PASS

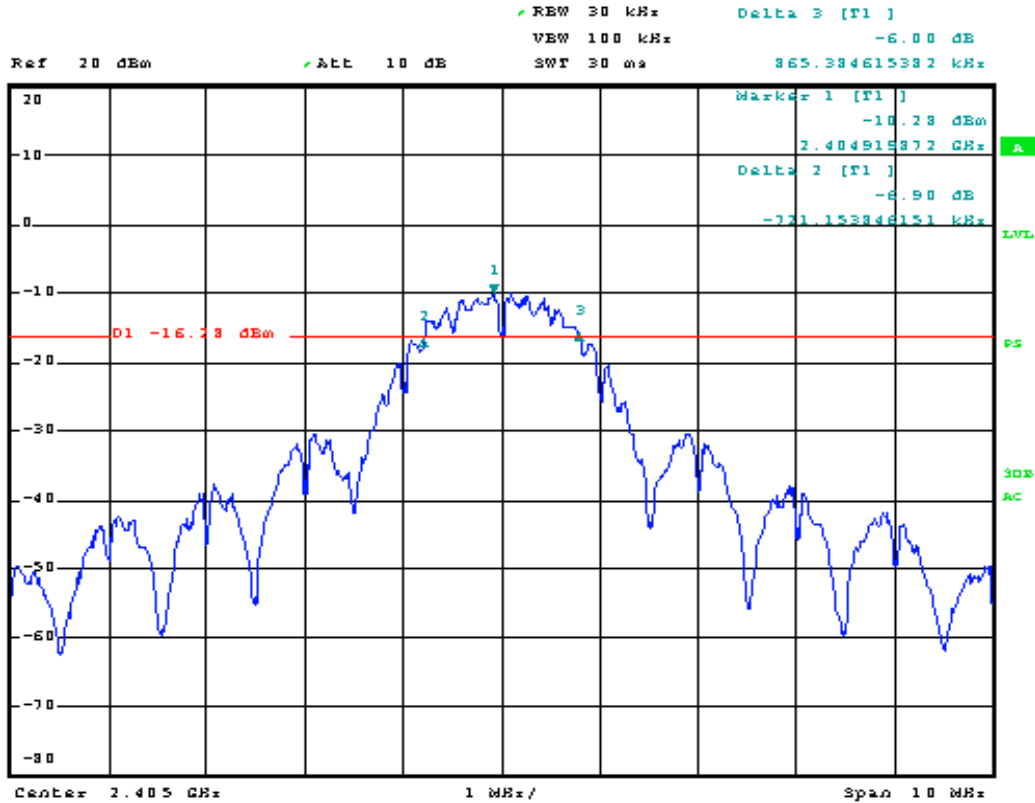
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Remote transmitter:

Test Data

Channel Low

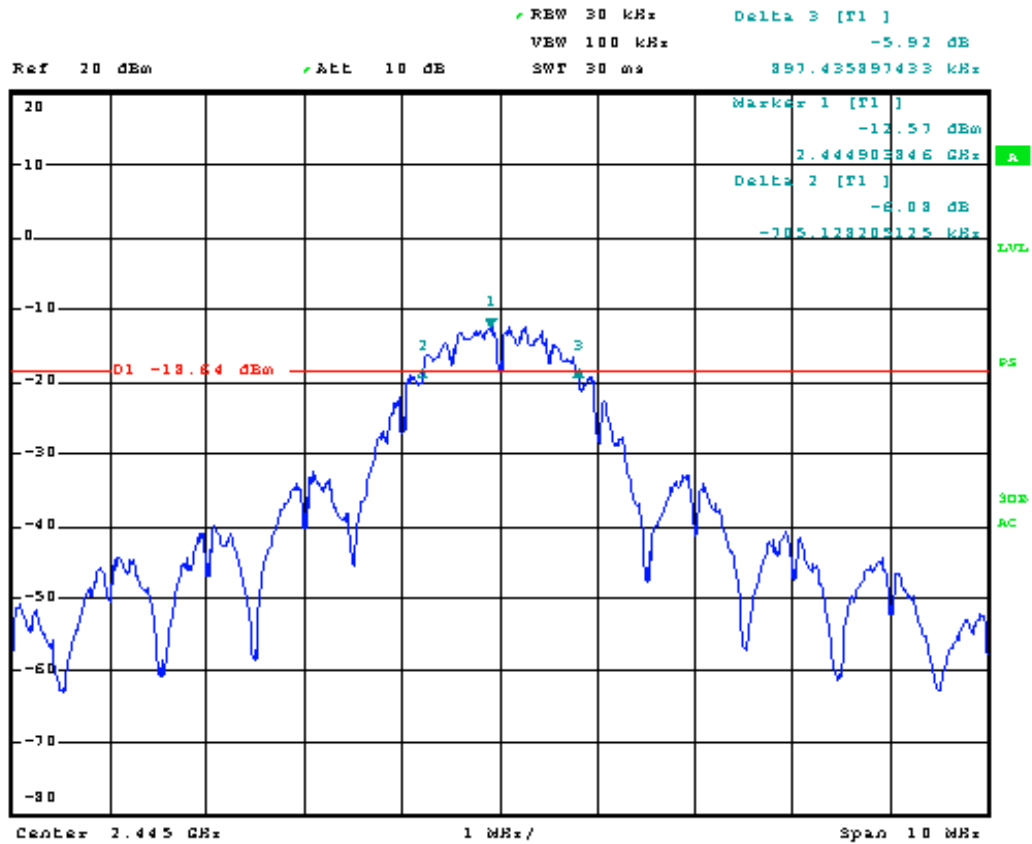


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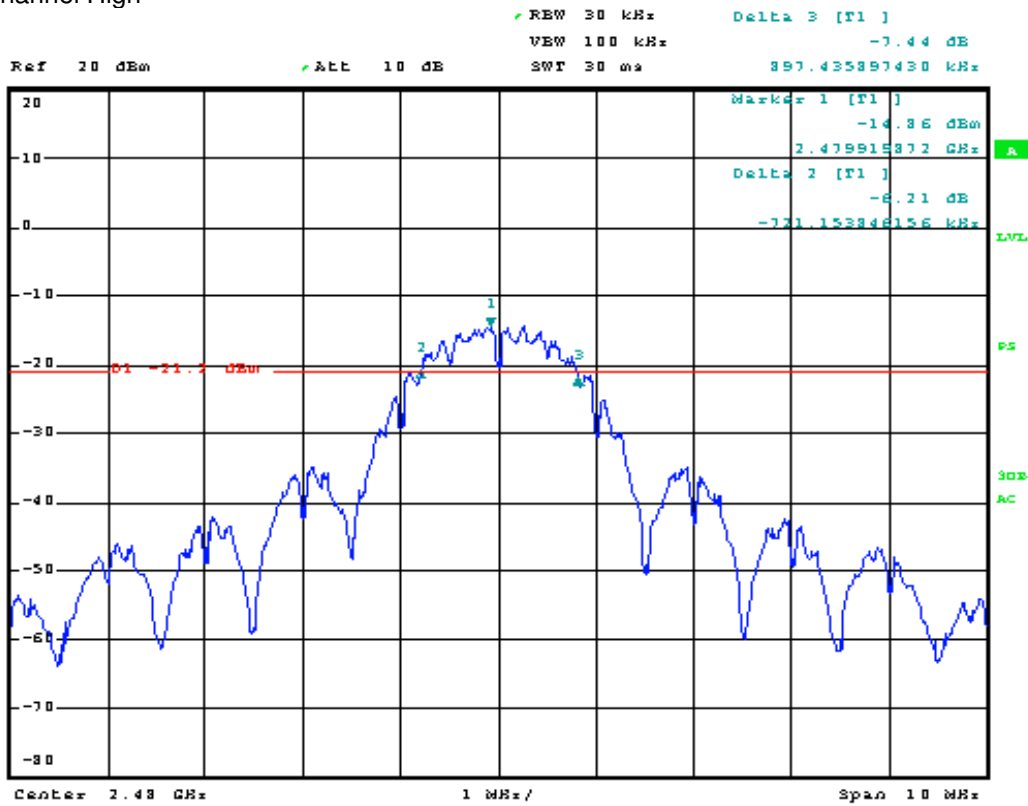
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Channel Middle



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Channel High



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5.3.4 100KHz Bandwidth Of Band Edges Measuremnet

Test Requirement: FCC 15.247(d)
RSS 210 A8.5

Test Methods: KDB 558074 & RSS GEN

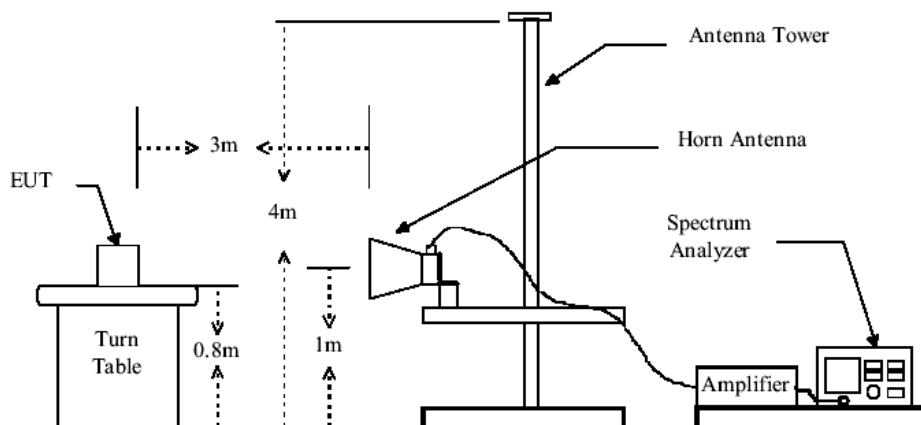
Test date: Jun 18,2010

Standard Applicable: According to section 15.247(c),in any 100KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating,the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power,In addition,radiated emissions which fall in the restricted bands,as defined in section 15.205(a),must also comply with the radiated emission limits specified in 15.209(a).

Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW=100KHz VBW=300KHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level. The turn table shall rotate 360 degrees to determine the position of maximum emission level.EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
6. Repeat above procedures until all frequency measured were complete.

Radiated Emission Test Set-up Frequency Over 1GHz

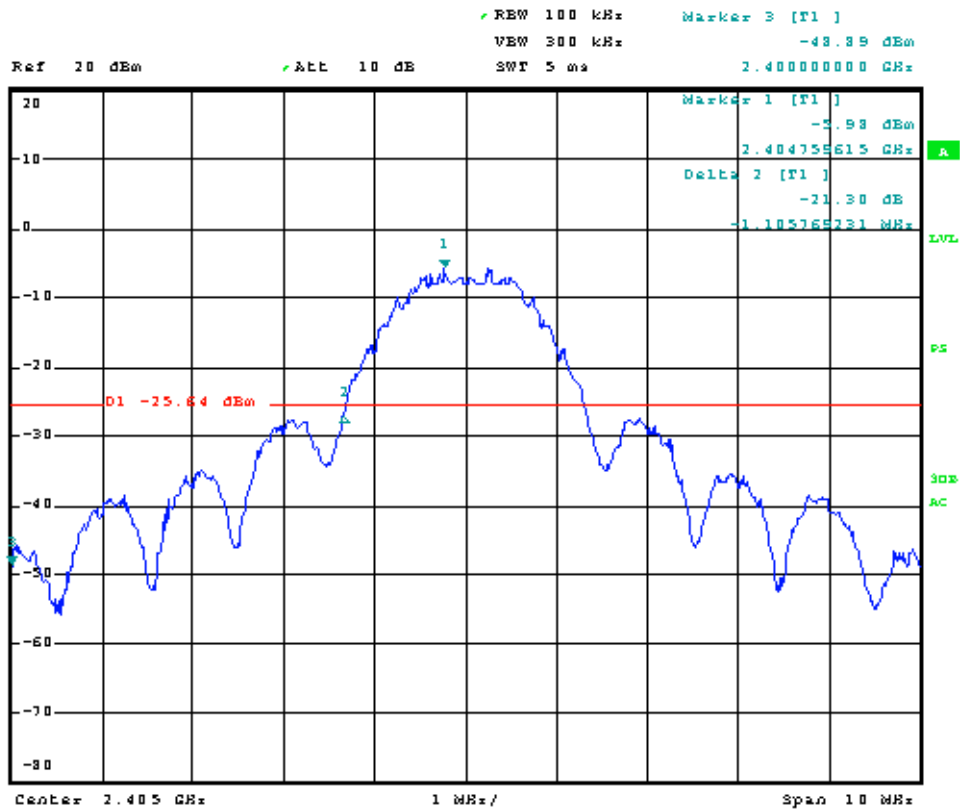


The field strength is calculated by adding the Antenna Factor, Cable Factor & preamplifier. The basic equation with a sample calculation is as follows:

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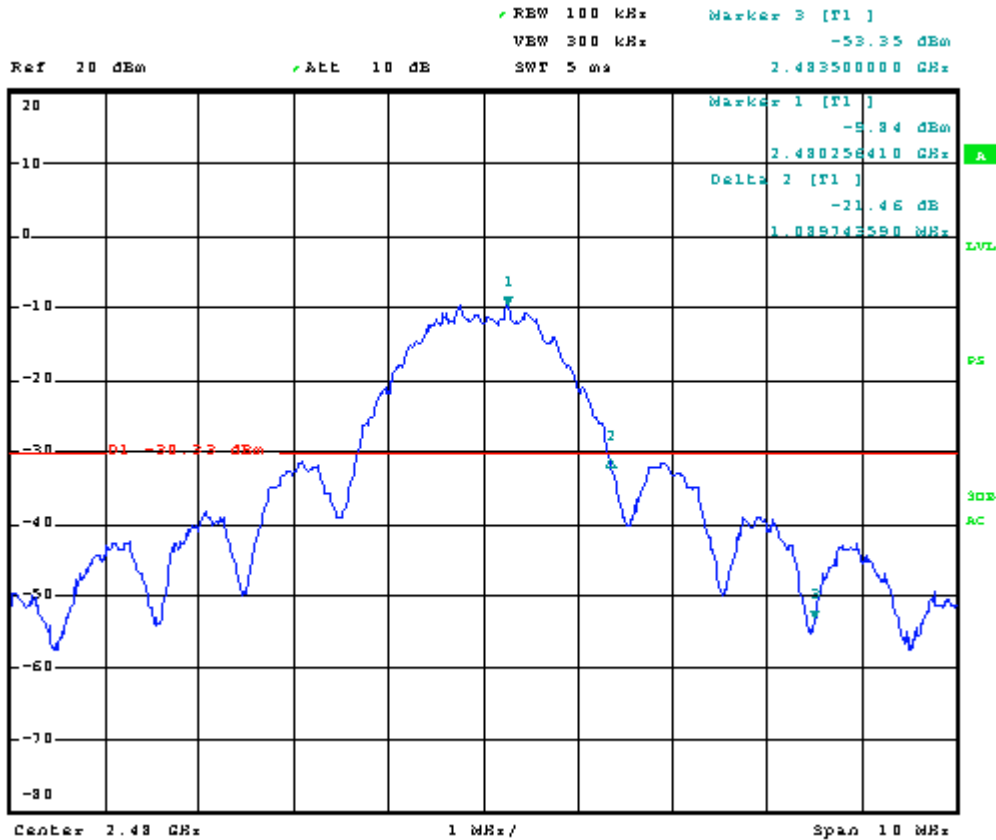
Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – preamplifier Factor

Measurement Result:
Remote transmitter
Band Edges Test Data CH-Low mode



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Band Edges Test Data CH-High mode



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Radiated Emission:

Remote transmitter

CH Low

Horizontal:

Frequency (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Factor (dB/m)	Peak Level (dBuV/m)	AV Level (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)
2390.00	40.47	30.00	-1.39	39.08	28.61	74.00	54.00
2483.50	40.00	29.80	-1.92	38.08	27.88	74.00	54.00

Vertical:

Frequency (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Factor (dB/m)	Peak Level (dBuV/m)	AV Level (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)
2390.00	43.00	30.00	-1.39	41.61	28.61	74.00	54.00
2483.50	41.00	30.22	-1.92	39.08	28.30	74.00	54.00

CH High

Horizontal:

Frequency (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Factor (dB/m)	Peak Level (dBuV/m)	AV Level (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)
2390.00	40.00	31.09	-1.39	38.61	29.70	74.00	54.00
2483.50	43.00	30.20	-1.92	41.08	28.28	74.00	54.00

Vertical:

Frequency (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Factor (dB/m)	Peak Level (dBuV/m)	AV Level (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)
2390.00	40.40	31.00	-1.39	39.01	29.61	74.00	54.00
2483.50	44.00	30.00	-1.92	42.08	28.61	74.00	54.00

Remark:

(1)Data of measurement within this frequency range shown"-."in the table above means the reading of emissions are attenuated more than 6dB below the permissible limits or the field strength is too small to be measured.

(2)Radiated emissions measured in the frequency above 1GHz were made with an instrument using Peak detector mode and average detector mode of the emission show in Actual FS colum.When measured Peak value is under AV Limit,It does not need to measure AV value again.

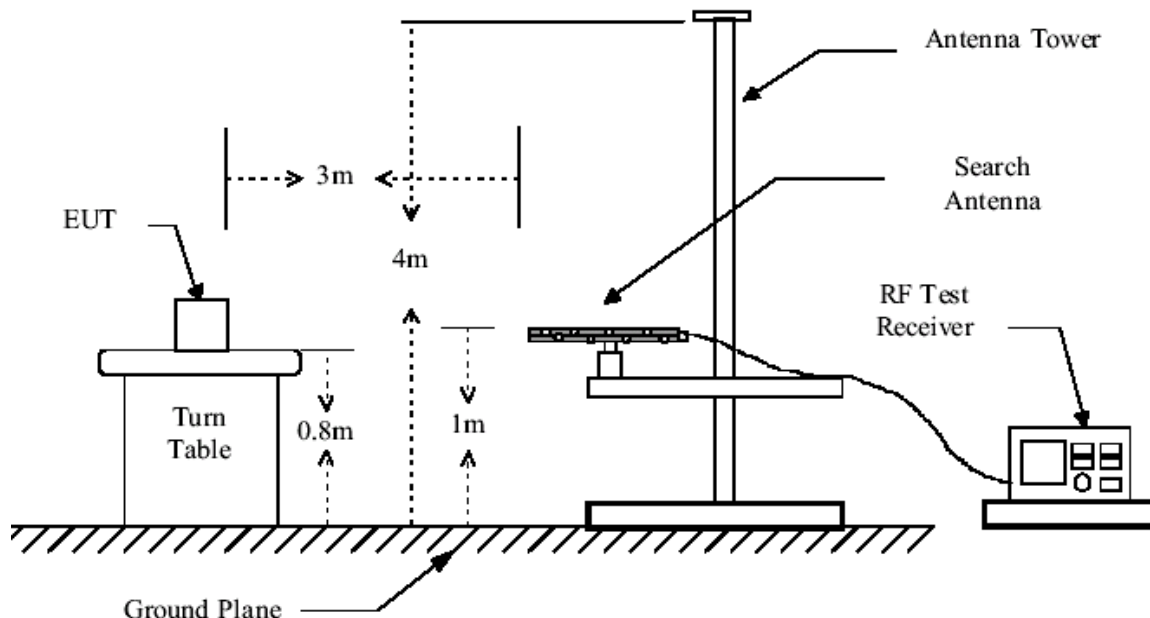
5.3.5 Spurious Radiated Emission Test

Test Requirement: FCC Part15 247(d)
Test methods: KDB 558074 & RSS GEN
Test date: Jun 18,2010
Standard Applicable: According to section 15.247(c),all other emissions outside these bands shall not exceed the general radiated emission limits specified in section15.209(a).And according to section 15.33(a)(1),for an intentional radiator operates below 10GHz,the frequency range of measurements:to the tenth harmonic of the highest fundamental frequency or to 40GHz,which is lower.

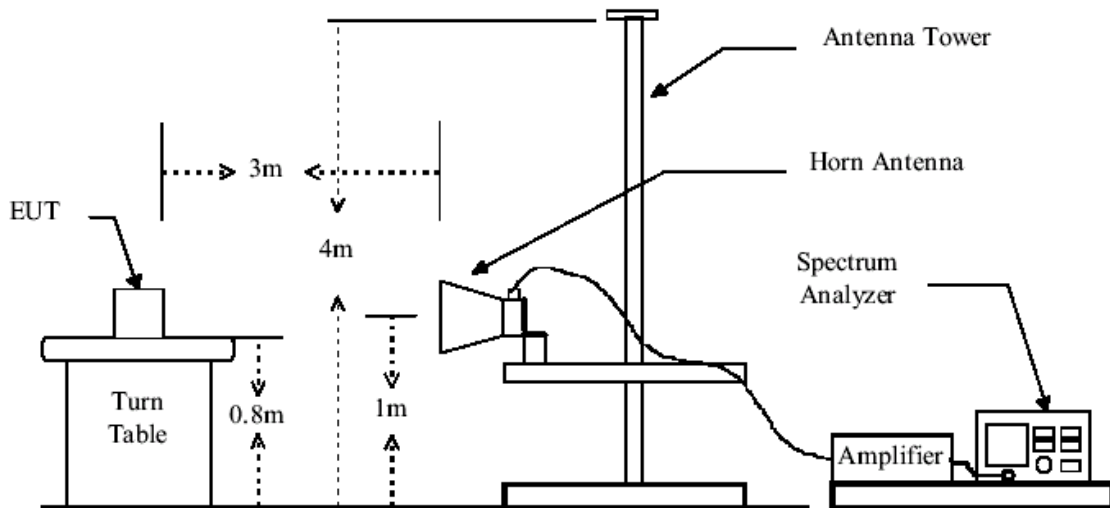
Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until all frequency measured were complete.

Radiated Test Set-up: Radiated Emission Test Set-up,Frequency Below 100MHz



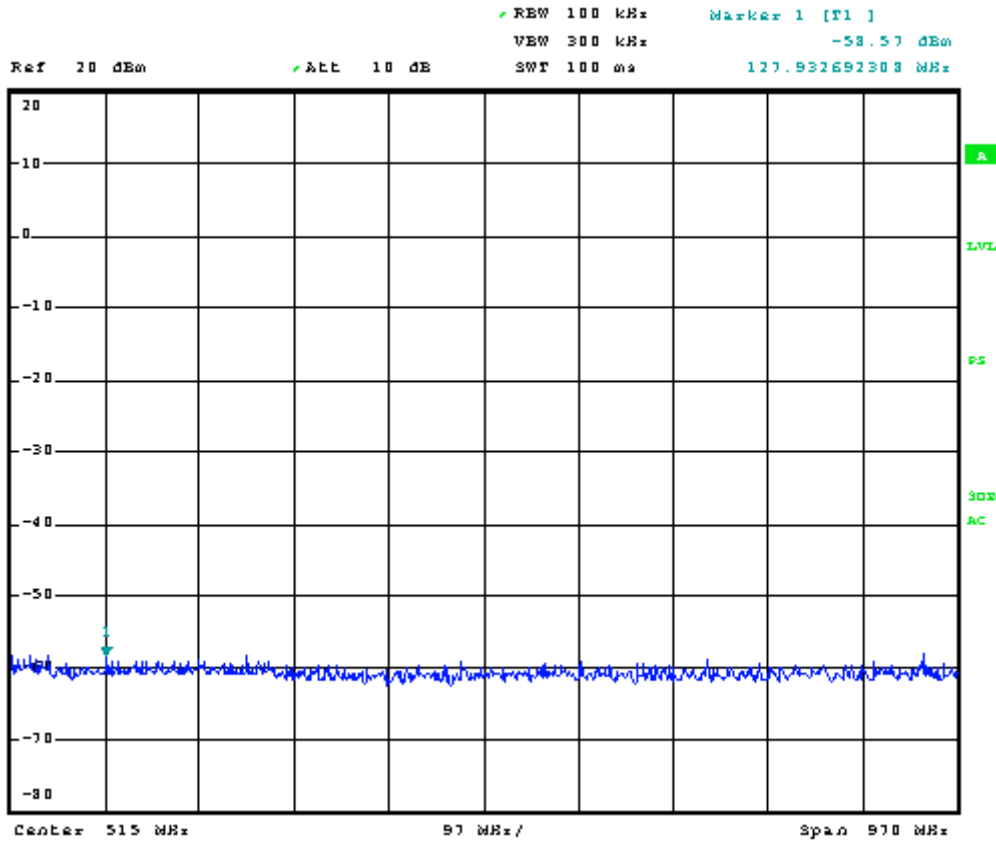
Radiated Emission Test Set-up Frequency Over 1GHz



The field strength is calculated by adding the Antenna Factor, Cable Factor & preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – preamplifier Factor

**Measurement Result:
Conducted spurious Emission Measurement Result**

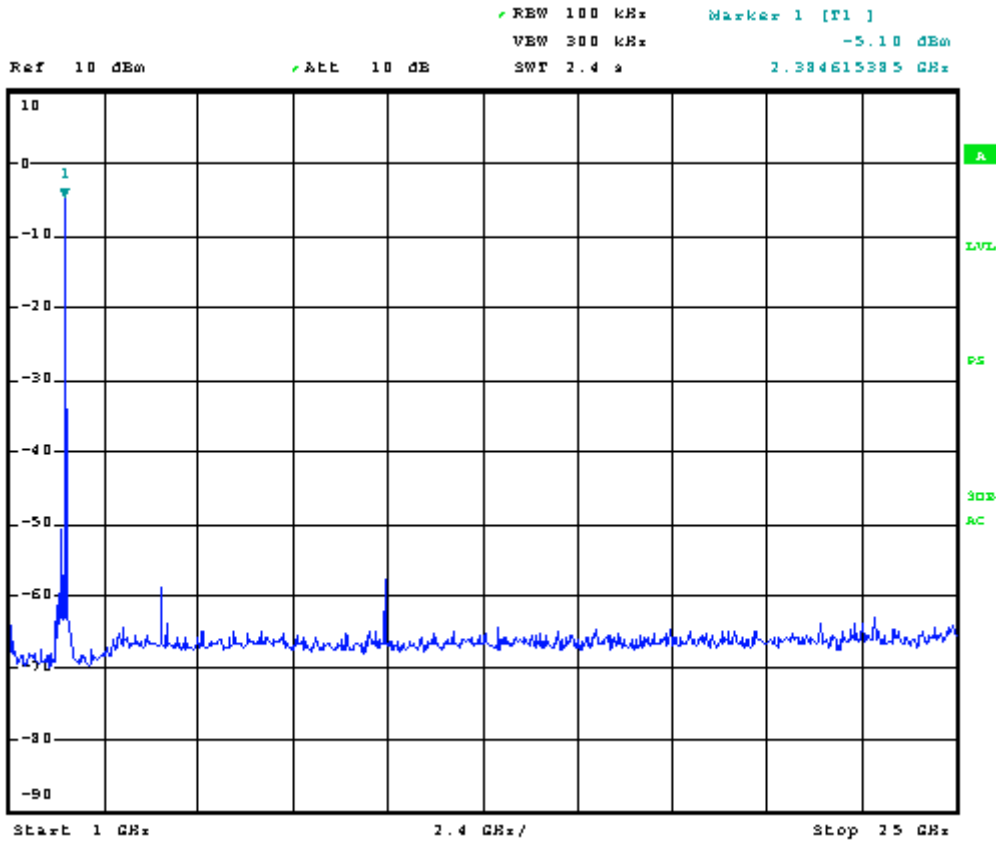
Remote transmitter
 CH Low



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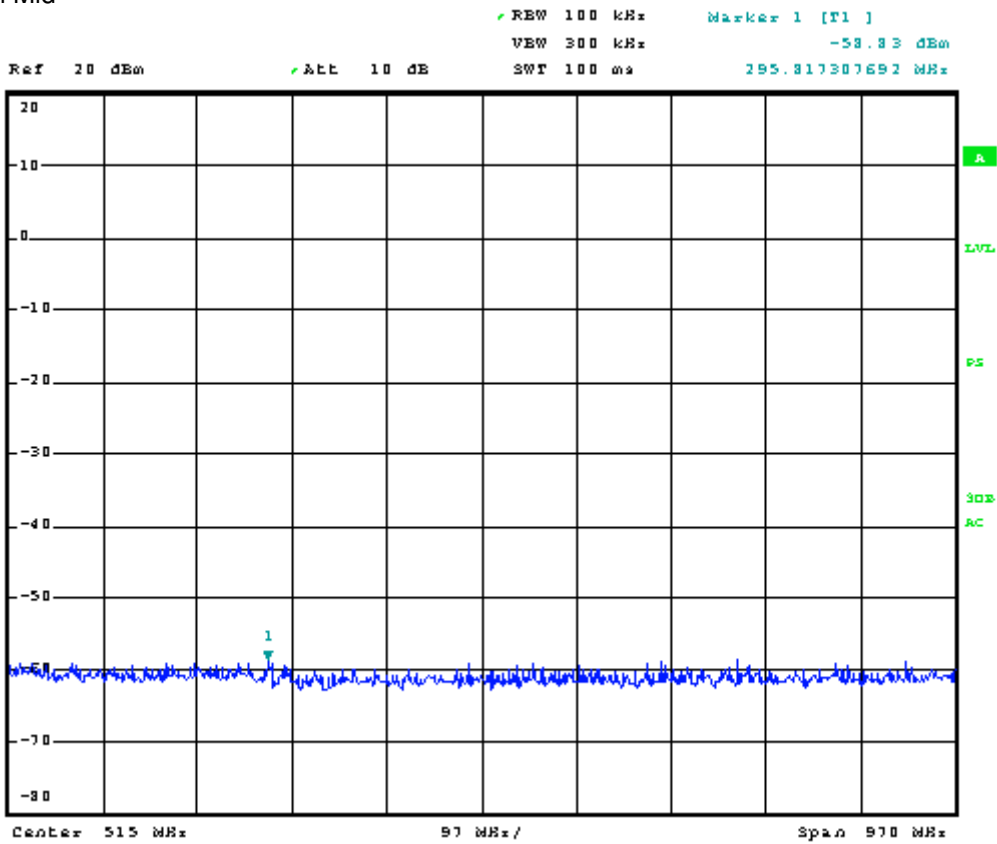


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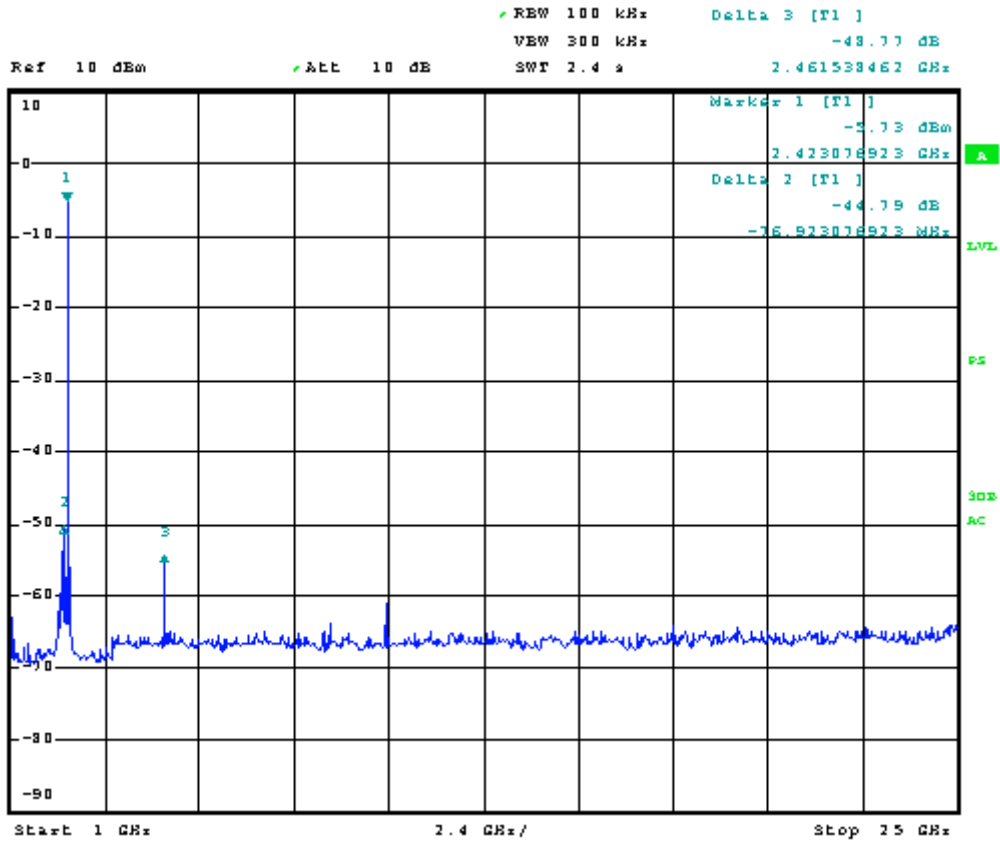
Ch Mid



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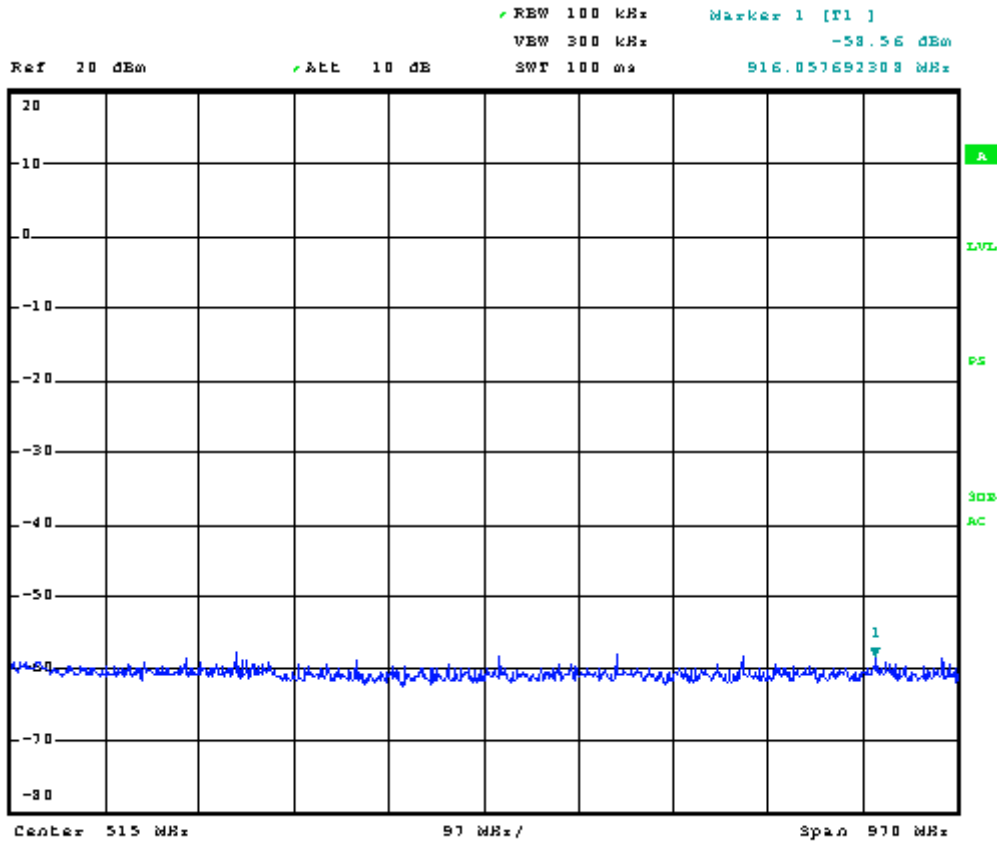


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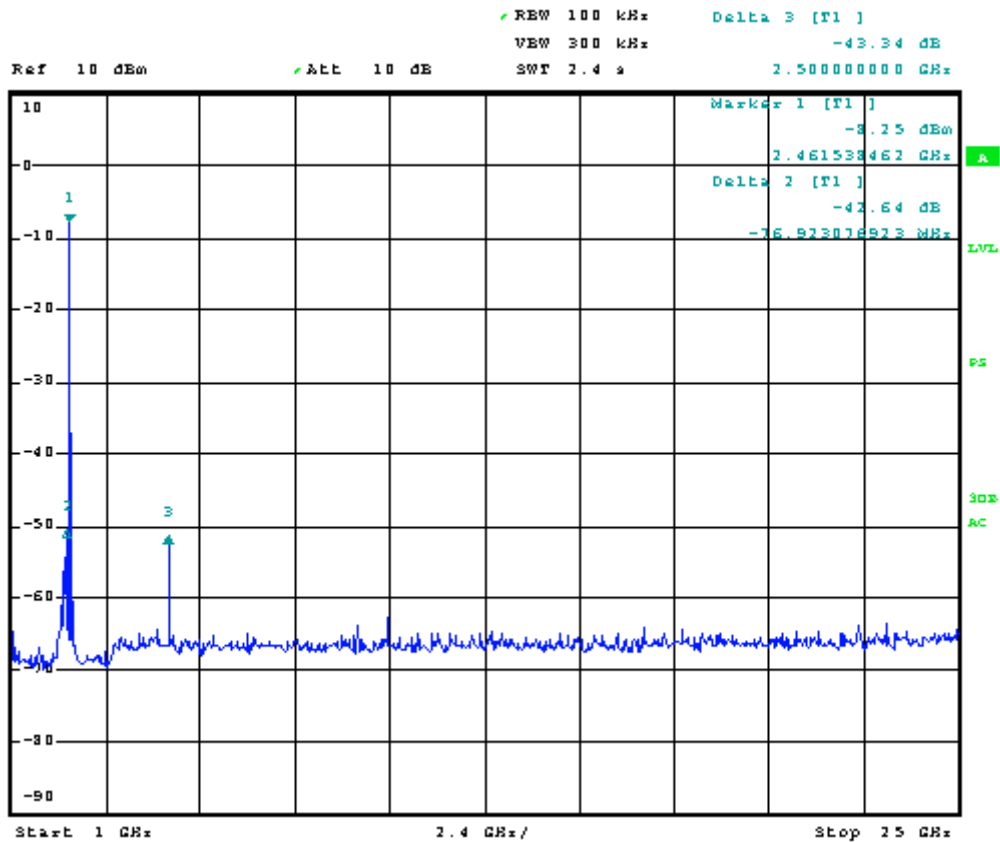
Ch High



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Radiated Spurious Emission Quasi-Peak Measurement Result

Note:Final Test Level =Receiver Reading +Factor

Factor= Antenna Factor + Cable Factor-preamplifier Factor

Remote transmitter

Operation Mode: CH Low

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Safe Margin (dB)	Ant.Pol (H/V)
408.00	42.7	-4.1	38.6	46.0	7.4	V
4810.00	58.4	-11.4	47.0	74.0	27.0	V
7215.00	48.4	-5.4	43.0	74.0	31.0	V
408.00	41.4	-4.1	37.3	46.0	8.7	H
4810.00	55.1	-11.4	43.7	74.0	30.3	H
7215.00	49.0	-5.4	43.6	74.0	30.4	H

Operation Mode: CH Mid

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Safe Margin (dB)	Ant.Pol (H/V)
408.00	43.0	-4.1	38.9	46.0	7.1	V
4890.00	58.0	-11.2	46.8	74.0	27.2	V
7335.00	48.2	-5.6	42.6	74.0	31.4	V
408.00	42.1	-4.1	38.0	46.0	8.0	H
4890.00	57.8	-11.2	46.6	74.0	27.4	H
7335.00	47.5	-5.6	41.9	74.0	32.1	H

Operation Mode: CH High

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Safe Margin (dB)	Ant.Pol (H/V)
408.00	42.8	-4.1	38.7	46.0	7.3	V
4960.00	57.5	-10.9	46.6	74.0	27.4	V
7350.00	49.3	-5.5	43.8	74.0	30.2	V
408.00	41.8	-4.1	37.7	46.0	8.3	H
4960.00	58.2	-10.9	47.3	74.0	26.7	H
7440.00	50.4	-5.5	44.9	74.0	29.1	H

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Note:

- 1. Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency.**
- 2. Data of measurement within this frequency range show "-" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.**
- 3. Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.**
- 4. Final Test Level =Receiver Reading +Factor
Factor= Antenna Factor + Cable Factor – preamplifier Factor**

5.3.6 Peak Power Spectral Density

Test Requirement: FCC 15.247(e)
RSS 210 A8.2

Test Methods: KDB 558074 & RSS GEN

Test date: Jun 7,2010

Standard Applicable: According to section 15.247(e),For digitally modulated systems,the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dB in any 3KHz band during any time in terval of continuous transmission.This power spectral density shall be determined in accordance with the provisions of paragraph(b) of this section.The same method of determining the conducted output power shall be used to determine the powr spectral density.

Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

Measurement Result:

Remote transmitter

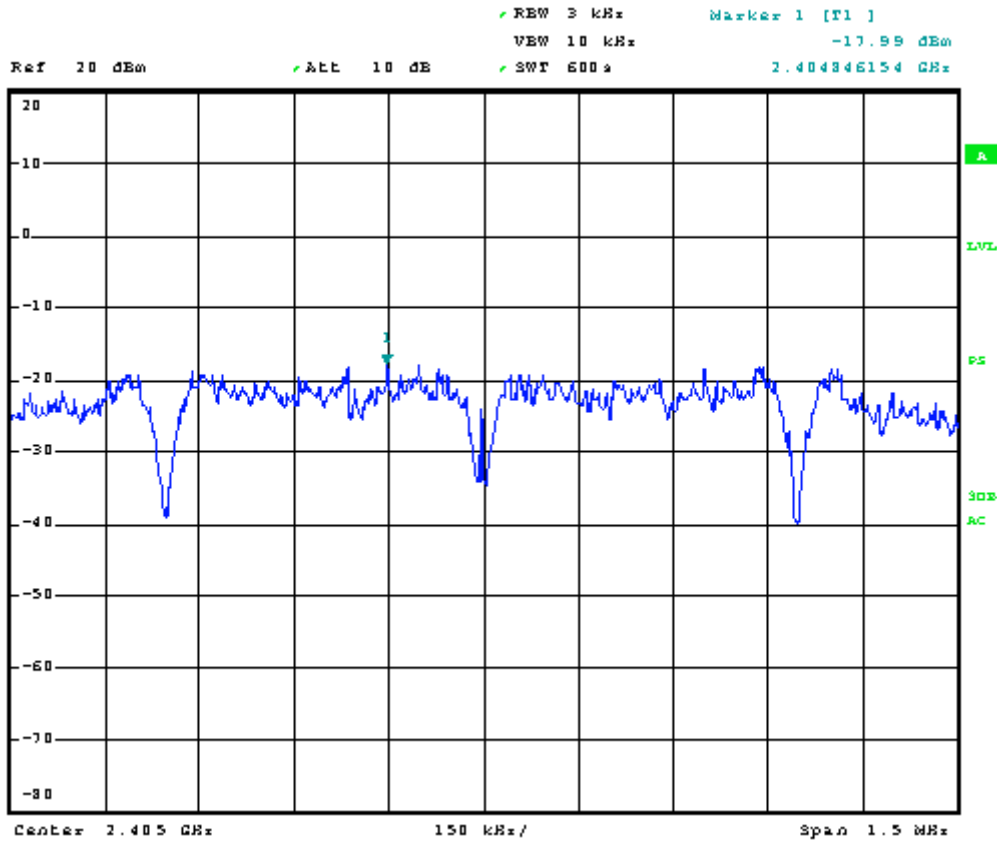
Test Results

CH	Frequency (MHz)	RF Power Density Reading (dBm)	Cable loss (dB)	RF Power Density Level(dBm)	Max Limit (dbm)
LOW	2405	-17.99	0.2	-17.79	8
MID	2445	-20.77	0.2	-20.57	8
HIGH	2480	-22.46	0.2	-22.26	8

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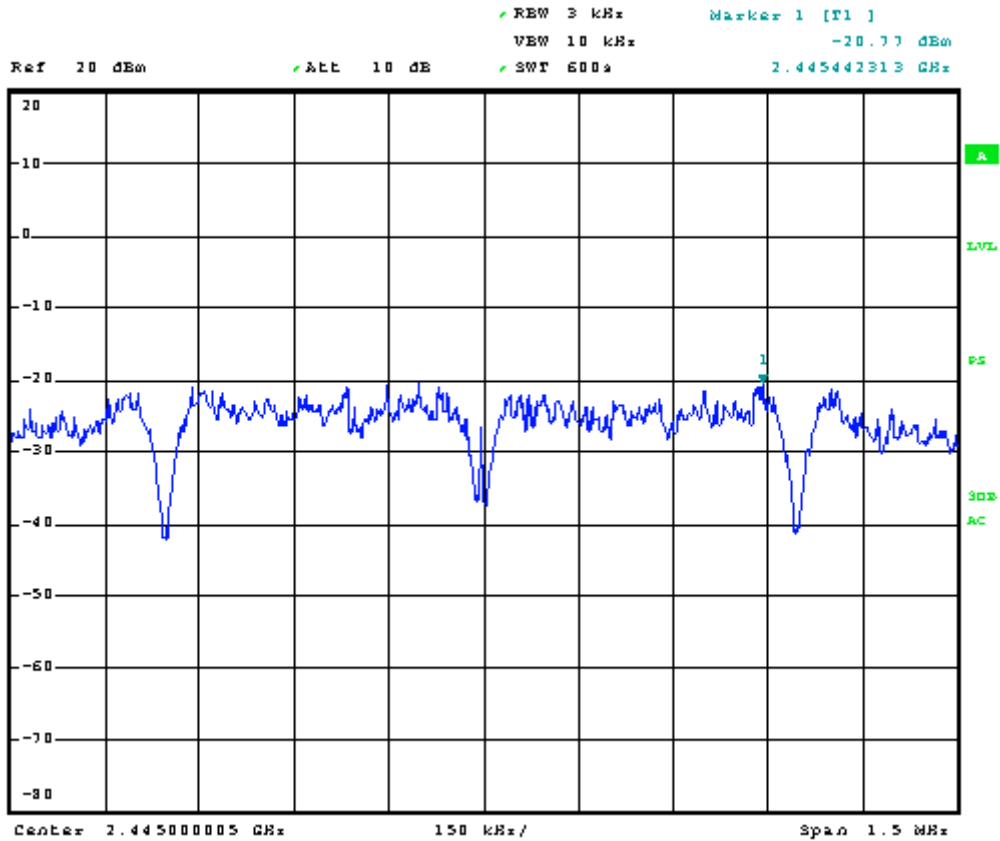
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Remote transmitter
Channel low



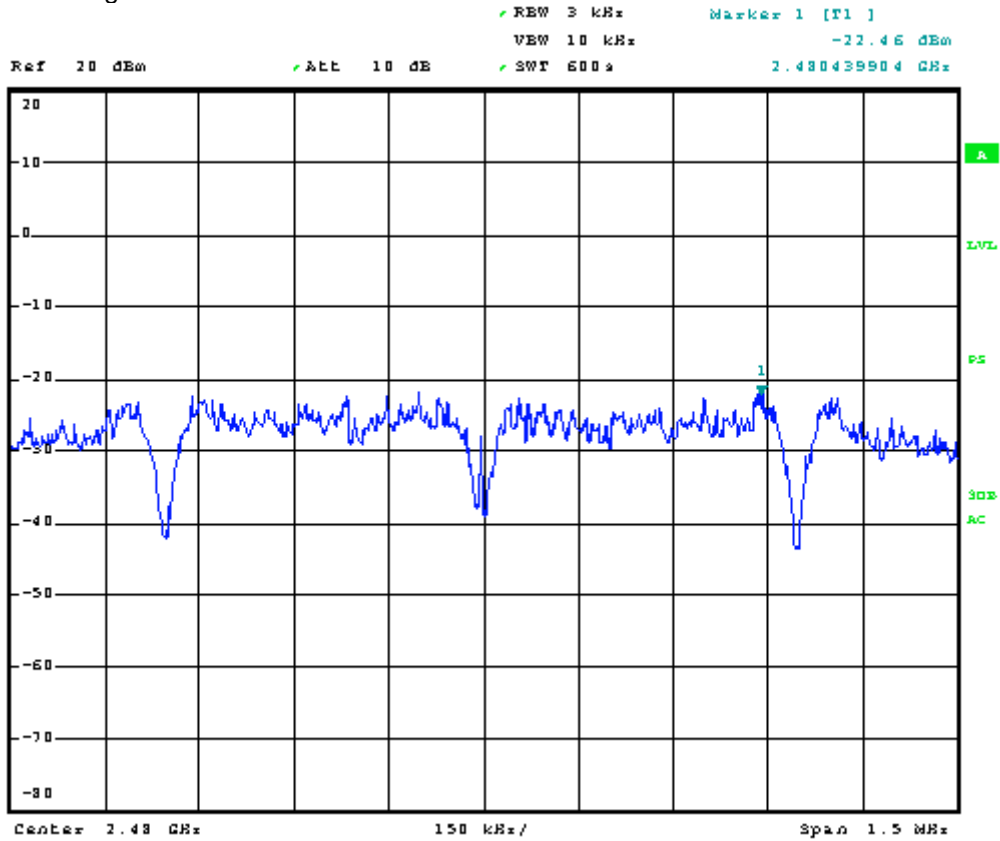
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Channel middle



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Channel high



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5.4 RF Exposure Compliance Requirement

5.4.1 Standard requirement

15.247(b)(4) requirement:

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TCB Exclusion List (11/10/2009)

Exposure category	low threshold	high threshold
general population	(60/fGHz) mW. (120/fGHz) mW.	(900/[fGHz] ^{-0.5}) mW.
occupational	(375/fGHz) mW. (900/fGHz) mW.	(2250/[fGHz] ^{-0.5}) mW.

5.4.2 EUT RF Exposure

The Max remote transmitter Conducted Peak Output Power is -0.19dBm(0.96mW)

remote transmitter: Antenna Gain(dBi)=2.5 dBi

According to the formula, calculate the EIRP test result:

remote transmitte:EIRP= P + G =2.31dBm ①

SAR requirement:

Low threshold= 60 / f(GHz) = 60/2.450 = 24.5 mW=13.89dBm ② ;

① < ②.

So the SAR report is not required.